DOCUMENT RESUME

ED 069 641 TM 002 066

TITLE	Yarn Service Trainee (synthetic fibers) 929.887--Technical Report on Development of USTES Aptitude Test Battery.
INSTITUTION	Manpower Administration (DOL), Washington, D.C. U.S. Training and Employment Service.
REPORT NO	USTES-TR-S-454
PUB DATE	Jul 70
NOTE	14p.
EDRS PRICE	MF-$0.65 HC-$3.29
DESCRIPTORS	*Aptitude Tests; *Cutting Scores; Evaluation Criteria; Job Applicants; *Job Skills; Norms; Occupational Guidance; *Personnel Evaluation; Test Reliability; Test Validity; *Trainees; Unskilled Workers
IDENTIFIERS	GATB; *General Aptitude Test Battery; Yarn Service Trainee

ABSTRACT

The United States Training and Employment Service General Aptitude Test Battery (GATB), first published in 1947, has been included in a continuing program of research to validate the tests against success in many different occupations. The GATB consists of 12 tests which measure nine aptitudes: General Learning Ability; Verbal Aptitude; Numerical Aptitude; Spatial Aptitude; Form Perception; Clerical Perception; Motor Coordination; Finger Dexterity; and Manual Dexterity. The aptitude scores are standard scores with 100 as the average for the general working population, and a standard deviation of 20. Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, when combined, predict job performance. Cutting scores are set only for those aptitudes which aid in predicting the performance of the job duties of the experimental sample. The GATB norms described are appropriate only for jobs with content similar to that shown in the job description presented in this report. A description of the validation sample and a personnel evaluation form are also included. (AG)

TM 002 066 ED 069641

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S-454

July 1970

U.S. Training and
Employment Service
Technical Report
S-454

Development of USTES

APTITUDE TEST
BATTERY FOR

YARN SERVICE TRAINEE

(synthetic fibers)
929.887

U.S. DEPARTMENT OF LABOR
Manpower Administration

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ED 069641

Technical Report on Development of USTES Aptitude Test Battery

For . . . . .

Yarn Service Trainee (synthetic fibers) 929.887

S-454

(Developed in Cooperation with the
Florida State Employment Service)

Manpower Administration
U.S. Department of Labor

July 1970

FOREWORD

The United States Training and Employment Service General Aptitude Test Battery (GATB) was first published in 1947. Since that time the GATB has been included in a continuing program of research to validate the tests against success in many different occupations. Because of its extensive research base the GATB has come to be recognized as the best validated multiple aptitude test battery in existence for use in vocational guidance.

The GATB consists of 12 tests which measure 9 aptitudes: General Learning Ability, Verbal Aptitude, Numerical Aptitude, Spatial Aptitude, Form Perception, Clerical Perception, Motor Coordination, Finger Dexterity, and Manual Dexterity. The aptitude scores are standard scores with 100 as the average for the general working population, with a standard deviation of 20.

Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, in combination, predict job performance. For any given occupation, cutting scores are set only for those aptitudes which contribute to the prediction of performance of the job duties of the experimental sample. It is important to recognize that another job might have the same job title but the job content might not be similar. The GATB norms described in this report are appropriate for use only for jobs with content similar to that shown in the job description included in this report.

DEVELOPMENT OF USTES APTITUDE TEST BATTERY

For

Yarn Service Trainee (synthetic fibers) 929.887-050

S-454

This report describes the research undertaken for the purpose of developing General Aptitude Test Battery (GATB) norms for the occupation of Yarn Service Trainee (synthetic fibers) 929.887-050. The following norms were established:

GATB Aptitudes	Minimum Acceptable GATB Scores
F - Finger Dexterity	65
M - Manual Dexterity	80

RESEARCH SUMMARY

Sample:

56 males employed as Yarn Service Trainees (also known as Material Handlers) at Monsanto Corporation in Pensacola, Florida. The sample was composed of 51 Negroes 5 non-minority group members.

Criterion:

Supervisory ratings

Design:

Longitudinal (tests were administered at the beginning of training and criterion data collected at the end of training).

Minimum aptitude requirements were determined on the basis of job analysis, and statistical analyses of aptitude mean scores, standard deviations, aptitude-criterion correlations, and selective efficiencies.

Predictive Validity:

Phi-Coefficient = .37 ($P/2 < .005$)

Effectiveness of Norms:

Only 68% of the non-test-selected workers used for this study were good workers; if the workers had been test-selected with the above norms, 80% would have been good workers. 32% of the non-test-selected workers used for this study were poor workers; if the workers had been test-selected with the above norms, only 20% would have been poor workers. The effectiveness of the norms is shown graphically in Table:

TABLE 1

Effectiveness of Norms

	Without Tests	With Tests
Good Trainees	68%	80%
Poor Trainees	32%	20%

SAMPLE DESCRIPTION

Size:

N = 56

Occupational Status:

Employed Workers

Work Setting:

Workers were employed at Monsanto Corporation, Pensacola, Florida in various routine laboring tasks. The 56 workers in the sample were selected to be trained as Yarn Service Trainees which is an entry level career ladder position.

Selection Requirements:

Age: No requirement stated.
Education: At least an eighth grade education.
Previous Experience: None required.
Tests: None used.

Principal Activities:

The job duties for each worker are comparable to those shown in the job description in the Appendix.

Minimum Experience:

All workers had one year of experience on the job.

TABLE 2

Means, Standard Deviations (SD), Ranges,
and Pearson Product-Moment Correlations
with the Criterion (r) for Age and Education

	Mean	SD	Range	r
Age (years)	33.7	6.1	19-50	-.274*
Education (years)	10.8	1.2	9-13	.058

*Significant at the .05 level.

EXPERIMENTAL TEST BATTERY

All twelve tests of the GATB, B-1002B, were administered to the validation sample during the period August 1968 through January 1969.

CRITERION

The criterion consisted of supervisory ratings on each individual at the completion of training. The criterion was obtained August 1969 through January 1970.

Rating Scale:

An adaptation of USTES Form SP-21 "Descriptive Rating Scale" was used (see **Appendix**). The scale consists of ten items covering different aspects of training performance with five alternatives for each item.

Reliability:

No measure of criterion reliability was obtained since only one rating was obtained.

Criterion Score Distribution:

Possible Range:	10-50
Actual Range:	**17-41**
Mean:	27.7
Standard Deviation:	5.6

Criterion Dichotomy:

The criterion distribution was dichotomozied into high and low groups by placing 32% of the sample in the low criterion group to correspond with the percentage of workers considered marginal or unsatisfactory. Workers in the high criterion group were designated as "good workers and those in the low criterion group as "poor workers." The critical criterion score is 26.

APTITUDES CONSIDERED FOR INCLUSION IN THE NORMS

Aptitudes were selected for tryout on the basis of a qualitative analysis of job duties involved and a statistical analysis of test and criterion data. Aptitudes K and M were considered because the qualitative analysis indicated that they were important. Both had relatively high mean scores. Aptitude Q was considered because it had a relatively high mean score and a relatively low standard deviation. A relatively high mean score or a low standard deviation may indicate some sample preselection.

TABLE 3

Qualitative Analysis
(Based on the job analysis, the aptitudes listed appear to be important to the job performance.

Aptitudes	Rationale
K - Motor Coordination	Necessary in order to work rapidly to change parts, remove threadline wraps, and assist in creeling and doffing.
F - Finger Dexterity	Required to use small tools for making adjustments to drawing machine.
M - Manual Dexterity	Needed for loading and unloading boxes and cartons.

TABLE 4

Means, Standard Deviations (SD), Ranges and Pearson Product-Moment Correlations with the Criterion (r) for the aptitudes of the GATB. N=56.

	Mean	SD	Range	r
G - General Learning Ability	70.9	10.8	52-108	.017
V - Verbal Aptitude	73.7	8.4	63-102	.196
N - Numerical Aptitude	69.4	15.4	38-121	.238
S - Spatial Aptitude	76.4	14.3	51-120	-.114
P - Form Perception	73.1	17.3	43-126	.155
Q - Clerical Perception	86.9	9.8	71-109	.018
K - Motor Coordination	80.7	18.4	49-126	167
F - Finger Dexterity	80.3	17.6	46-124	.295*
M - Manual Dexterity	101.8	20.5	50-136	.066

*Significant at the .05 level

TABLE 5

Summary of Qualitative and Quantitative Data

Type of Evidence	Aptitudes								
	G	V	N	S	P	Q	K	F	M
Job Analysis Data:									
Important							X	X	X
Irrelevant									
Relatively High Mean Score						X	X	X	X
Relatively Low Standard Deviation	X	X		X		X			
Significant Correlation with the Criterion									
Aptitudes to be Considered for Trial Norms						Q	K	F	M

DERIVATION AND VALIDITY OF NORMS

Final norms were derived on the basis of a comparison of the degree to which trial norms consisting of various combinations of aptitudes Q, K, F and M at trial cutting scores were able to differentiate between the 68% of the sample considered good workers and the 32% considered poor workers. Trial cutting scores at the five point interval nearest to one standard deviation below the mean for each aptitude are tried because this will eliminate about one-third of the sample with three-aptitude norms. For two-aptitude norms, minimum cutting scores slightly higher than one standard deviation below the mean will eliminate about one-third of the sample; for four-aptitude trial norms, cutting scores of slightly lower

than one standard deviation below the mean will eliminate about one-third of the sample. The phi coefficient was used as a basis for comparing trial norms. Norms of F-65 and M-80 provided optimum differentiation for the occupation of Yarn Service Trainee (synthetic fibers) 929.887-050. The validity of the norms is shown in Table 6 and is indicated by a phi coefficient of .37 (statistically significant at the .005 level).

TABLE 6

Predictive Validity of Test Norms
F-65 and M-80

	Nonqualifying Test Scores	Qualifying Test Scores	Total
Good Trainees	6	32	38
Poor Trainees	10	8	18
Total	16	40	56

Phi coefficient = .37 Chi square (X^2_y) = 7.6

Significance level = P/2 $<$ .005

DETERMINATION OF OCCUPATIONAL APTITUDE PATTERN

The data for this study did not meet the requirements for incorporating this occupation into any of the 62 OAP's included in the 1970 edition of Section II of the Manual for the General Aptitude Test Battery. The data for this sample will be considered for future groupings of occupations in the development of new occupational aptitude patterns.

SP-21
Rev. 5/67

A-P-P-E-N-D-I-X

DESCRIPTIVE RATING SCALE
(For Aptitude Test Development Studies)

Score_____

RATING SCALE FOR_____
D. O. T. Title and Code

Directions: Please read Form SP-20, "Suggestions to Raters", and then fill in the items listed below. In making your ratings, only one box should be checked for each question.

Name of Worker (print)_____
(Last) (First)

Sex: Male_____ Female_____

Company Job Title:_____

How often do you see this worker in a work situation?

1. _____ See him all the time.
2. _____ See him at work several times a day.
3. _____ Seldom see him in a work situation.

How long have you worked with him?

1. _____ Under one month.
2. _____ At least one month but less than two.
3. _____ At least two months but less than three.
4. _____ At least three months but less than six.
5. _____ Six months or over.

A. What is his degree of manual dexterity?

1. _____ Unsatisfactory -- awkward -- handles himself slowly -- not able to keep up.

2. _____ Performs satisfactorily but below levels expected of average worker in this operation.

3. _____ Performs satisfactorily most of the time.

4. _____ Well above average -- handles himself well -- fast and accurate.

5. _____ Outstanding -- handles himself extremely well with noticeable ease and economy of motion.

B. Safety Performance.

1. _____ Performance below minimum standards -- will take a chance -- is injury prone.

2. _____ Performance is up to minimum standards -- has a tendency to be careless -- unaware of fellow employes' safety.

3. _____ Performance is above minimum standards -- has a satisfactory knowledge and application of safety procedures.

4. _____ Performance above average -- seldom violates safety rules -- exercises good judgement safety-wise.

5. _____ Performance is on an outstanding level -- requires little or no follow-up -- personal dress and tool handling is exceptionally safe.

C. How much work can he get done? (Worker's ability to make sufficient use of his time.)

1. _____ Capable of very low work output.

2. _____ Capable of low work output.

3. _____ Capable of fair work output.

4. _____ Capable of high work output.

5. _____ Capable of very high work output.

D. Quality of Work.

1. _____ Below area standards -- has excessive number of off-standards -- is inconsistent in quality checks.

2. _____ Meets minimum area standards -- requires excessive supervision and follow-up -- makes frequent quality errors.

3. _____ Above minimum area standards -- is satisfactory in accuracy of work.

4. _____ Well above area standards -- seldom makes a mistake -- good, accurate worker.

5. _____ Quality performance is outstanding -- work is accurate and complete.

E. Initiative and Leadership.

1. _____ Always waits to be told what to do and still needs some help in getting started.

2. _____ Relies on others -- must be told what to do -- seldom helps fellow workers.

3. _____ Will act voluntarily in matters involving deviation of routine -- usually sets a good example for fellow workers.

4. _____ Will act voluntarily in most matters -- frequently influences good performance from fellow workers.

5. _____ Displays a great deal of zeal for his job -- alert at all times -- regarded as a good leader by the work group.

F. How much does he know about his job? (Worker's understanding of the principles, equipment, materials and methods that have to do directly or indirectly with his work.)

1. _____ Has very limited job knowledge -- does not know enough to do his job adequately.

2. _____ Has little knowledge -- knows enough to "get by."

3. _____ Has moderate amount of knowledge -- knows enough to do fair work.

4. _____ Has broad knowledge -- knows enough to do good work.

5. _____ Has complete knowledge -- knows his job thoroughly.

G. How large a variety of job duties can he perform efficiently? (Worker's ability to handle several operations in his work.)

1. _____ Cannot perform different operations adequately.

2. _____ Can perform several different operations with reasonable efficiency.

3. _____ Can perform a limited number of different operations efficiently.

4. _____ Can perform many different operations efficiently.

5. _____ Can perform an unusually large variety of different operations efficiently.

H. How resourceful is he when something different comes up or something out of the ordinary occurs? (Worker's ability to apply what he alreadys knows to a new situation.)

1. _____ Almost never able to figure out what to do and needs help on nearly every minor problem.

2. _____ Often has difficulty handling new situations. Needs help on all but minor problems.

3. _____ Sometimes knows what to do; sometimes doesn't. Can deal with problems that are not too complex.

4. _____ Is usually able to handle new situations. Needs help on only complex problems.

5. _____ Practically always figures out what to do himself.

I. How much aptitude or facility does he have for this kind of work? (Worker's adeptness or knack for performing a job easily and well.)

1. _____ Has great difficulty doing his job -- not at all suited for this type of work.

2. _____ Usually has some difficulty doing his job -- not too well suited to this kind of work.

3. _____ Does his job without too much difficulty -- fairly well suited to this type of work.

4. _____ Usually does his job without difficulty -- well suited to this kind of work.

5. _____ Does his job with great ease -- exceptionally well suited for this kind of work.

J. Considering all the factors already rated, and only these factors, how acceptable is his work? (Worker's "all-around ability" to do his job.)

1. _____ Would be better off without him -- performance usually not acceptable.

2. _____ Of limited value to the organization -- performance somewhat inferior.

3. _____ A fairly proficient worker -- performance generally acceptable.

4. _____ A valuable worker -- performance is usually superior.

5. _____ An unusually competent worker -- performance almost always top notch.

July 1970 S-454R

FACT SHEET

Job Title:

Yarn Service Trainee (synthetic fibers) 929.887

Job Summary:

Loads, unloads. and conveys materials and performs certain minor maintenance under specific instructions.

Work Performed:

Maintains continuous supply of bobbin yarn at packing area, checks and ascertains all identification information for correctness, and pushes cart to packing station. Unpacks yarn for backwinding. Loads and unloads tote boxes, cartons, conveyors, and cars. Aids machine operators by removing large threadline wraps using Calrod unit. Makes simple adjustments or repairs to drawing machines, such as, replacing drive tapes, removing drive roll tapes, removing tubes stuck on spindles, and removing spindle assemblies. Cleans undercarriage of machine using brushes, rags and solvents. Collects and disposes of trash from work and rest areas. Assembles and weighs bagged fiberstock.

Effectiveness of Norms:

Only 68% of the nontest-selected wokrers used for this study were good workers; if the workers had been test-selected with the S-454R norms, 78% would have been good workers. Thirty-two percent of the nontest-selected workers used in this study were poor workers; if the workers had been test-selected with the S-454R norms, only 22% would have been poor workers.

Applicability of S-454R Norms:

The aptitude test battery is applicable to jobs which include a majority of the duties described above.

GPO 899.077